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(54) Personal Health Care Device

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ABSTRACT OF THE DISCLOSURE

A hand-held personal health care device for the polishing of teeth wherein the appliance containing the cleaning agent is driven in an oscillatory manner.

PERSONAL HEALTH CARE DEVICEBackground of the Invention

The benefits to health derived from the continual periodic cleansing of teeth by an individual has been clearly demonstrated over the years. In order to obtain these benefits, the selection of an appropriate type of personal health care device to provide the desired cleansing and polishing effects has been found most important.

The combined utilization of bacteria disturbing vehicles for use at and below the gum line, such as dental tape and floss, along with a thorough cleansing and polishing of the exposed surfaces of the teeth are now generally accepted by the professionals in the dental field as providing the best practical care. While the conventional toothbrush is the most common personal device employed, the dental professional utilizes a flexible rotating cleansing-polishing appliance which contains the cleansing agent therein. Numerous attempts have been made to provide a similar hand-held device for individual usage at locations remote from the specialized equipment and drive mechanisms which are common to the professional office.

Size and shape of the device are primary considerations since the operative end must be capable of manipulation throughout the mouth in order to contact the exposed surfaces of the teeth. In addition, dental care devices require that the portion containing the particular appliance for the task at hand be angled with respect to the axis of the main body of the device in order to insure that the appliance effectively contacts the multiple faces of the teeth.

At present, the need for slim line, hand-held personal health care devices has generated a family of



1 products capable of providing a cleansing and polishing
2 effect and which is intentionally made small for inser-
3 tion into the oral cavity and angled from the body of the
4 device to facilitate hand manipulation by the individual
5 unskilled user. One such device is disclosed in my
6 prior U.S. patent No. 3,921,298 wherein continuous rota-
7 tional motion via flexible drive means of an appliance
8 provides polishing and cleansing functions.
9

10 One common problem in the design of these small
11 devices with tapered angled operative ends is the accom-
12 modation of a motion translating mechanism in the small
13 cross-sectional area available. The hand-held device
14 typically utilizes an electric motor connected to either
15 an internal or external power supply with a rotating
16 shaft extending axially within the housing. In applica-
17 tions wherein continuous rotational movement of the ap-
18 pliance is the desired end, it is known to provide a flex-
19 ible belt and pulley drive mechanism within the narrow
20 confines of the angular operating end. In the operation
21 of this type of device for home usage, the operating
22 conditions are not controlled by professionally-trained
23 staff and the varying pressures applied by the user often
24 lead to undue heat generation at the tooth surface, in-
25 ternal belt slippage and a frequent need to replace the
26 belting. While the flexible belt drive is found satis-
27 factory under many conditions it provides continual
28 rotational movement of the appliance. While this type
29 of movement is acceptable under controlled conditions,
30 an individual operator failing to turn the device off
31 while it remains within the oral cavity causes residual
32 matter on the appliance to fly about the area.
33

34 Accordingly, the present invention is directed
35 to a personal health care device for use by individuals
36 wherein the small cross-sectional area of the operating
37 end includes an oscillatory drive mechanism. In addition,
38 the appliance is located proximate to the small end

1 region of an angled operating end to facilitate manipu-
2 lation by the user. Further, the oscillating drive
3 mechanism provides a positive direct linking between the
4 internal drive and driven means to substantially elimin-
5 ate internal slippage and reduce the need for the replace-
6 ment of parts therein.

7
8 Summary of the Invention

9 The present invention relates to a personal
10 health care device for use by individuals without the
11 direct supervision or control of professional staff. The
12 device is especially well-suited for use in polishing and
13 cleaning the exposed surfaces of teeth.

14
15 The device includes a containment means for
16 housing a drive mechanism and has an operative end of
17 small cross-sectional area and a hand-grippable body
18 portion. The operative end is constructed so that at
19 least a portion thereof is angled with respect to the
20 axis of the body for enhancing the efficacy of the device.

21
22 A power drive means is mounted within the con-
23 tainment means and either an external electrical connec-
24 tion can be provided or rechargeable battery operation
25 can be utilized. The nature of the power supply can be
26 selected by the type of usage expected. The power drive
27 means includes an output shaft which rotates upon actua-
28 tion of suitable control means and extends substantially
29 axially along the body portion of the containment means.
30 A drive means is mounted for rotation about a first axis
31 within the operating end and is operatively coupled to
32 the output shaft.

33
34 Also, the operative end includes driven means
35 mounted therein for rotation about a second axis. The
36 driven means has an engaging means affixed thereto which
37 extends outwardly of the operative end for removably
38 receiving an appliance thereon. A non-planar connection

1 means is coupled to both the drive and the driven means
2 to permit incorporation within the angled operative end.
3 In addition, the connection means is coupled to impart
4 oscillatory motion to the driven means. This is accom-
5 plished by coupling one end of the connection means to the
6 drive means a first distance from the first axis while
7 coupling the opposing end to the driven means a second
8 distance from the second axis. The first distance is
9 less than the second distance so that a 360 degree rota-
10 tion of the drive means in response to the drive shaft
11 results in an oscillatory movement of the driven means
12 about the second axis.

13
14 The engaging means affixed to the driven means
15 is therefore provided with an oscillatory movement. The
16 engaging means which extends outwardly of the operative
17 end via a suitable bushing is provided with an expanded
18 diameter end for removably receiving an appliance, typi-
19 cally a conventional cleansing-polishing cup with a rib-
20 bed external cavity for receiving paste material to be
21 applied to the surfaces of the teeth.

22
23 Further features and advantages of the invention
24 will become more readily apparent from the following de-
25 tailed description of specific embodiments of the inven-
26 tion when taken in conjunction with the accompanying
27 drawings.

28 Brief Description of the Drawings

29 Fig. 1 is a view in perspective of one embodi-
30 ment of the invention.
31

32
33 Fig. 2 is a side view of the embodiment of
34 Fig. 1.

35
36 Fig. 3 is a top view in section taken along
37 line 3-3 of Fig. 2.
38

1 Fig. 4 is a side view in section taken along
2 line 4-4 of Fig. 3.

3
4 Fig. 5 is a side view in section similar to
5 Fig. 4 of another embodiment of the invention.

6
7 Description of the Preferred Embodiment

8 Referring now to the embodiment of Figs. 1 and
9 2, a personal health care device 10 is shown including
10 containment means 11 having a hand-grippable body portion
11 12 with external switch button 23 and an operating end 14
12 of reduced cross-sectional area. The opposing end of
13 containment means 11 is provided with external electrical
14 connection 15 having a flexible waterproof reinforcing
15 section 16 provided adjacent the containment means. How-
16 ever, the external a-c connection may be replaced by
17 internal battery means as the power supply with conven-
18 tional recharging receptacles provided for the external
19 connection. The containment means is formed in upper
20 and lower sections as indicated by parting line 18 in
21 order to permit assembly and testing prior to forming the
22 sealed unit. This feature provides distinct manufactur-
23 ing advantages.

24
25 At the end of operating end 14, a region 22 of
26 substantially reduced cross-sectional area is angularly
27 displaced in an upward direction from the longitudinal
28 axis of the body portion 12. This orientation of the
29 portion of the device placed within the oral cavity of
30 the user facilitates the manipulation of the device by
31 the user to permit the contact of appliance 20 with the
32 variously oriented surfaces of the teeth. The combina-
33 tion of small cross-sectional area and angular displace-
34 ment in the operative end have heretofore tended to limit
35 the types of drive mechanisms available for use therein
36 while favoring the use of flexible belt drives and their
37 360 degree rotational drive of the tip-mounted accessory
38 20. The present invention utilizes a novel drive assembly

1 which is readily accommodated in this type of containment
2 means and provides a different drive motion for the acces-
3 sory 20.
4

5 The accessory 20 is generally a flexible cup
6 containing internal ribs or vanes within the cup. In
7 operation, a cleansing-polishing agent is added to the
8 cup and the cup is placed in contact with the surface of
9 the teeth. Heretofore, the 360 degree rotation of such
10 accessories has placed the burden on the user to actuate
11 the device after it is within the oral cavity to prevent
12 the agent from being sprayed about. This result has tend-
13 ed to reduce consumer acceptance of devices of this type.
14 The present invention providing an oscillatory motion of
15 the accessory 20 does not generate this undesirable
16 result nor does it create the heat of a continually rot-
17 ating head which often leads to user discomfort.
18

19 The manner of affixation of the accessory 20
20 to the engaging means is not apparent from viewing Figs.
21 1 and 2 since, in operation, a flexible sleeve or boot 21
22 is provided between the accessory and region 22 of the
23 operative end. The sleeve frictionally engages the ex-
24 tended portion of the operative end as well as the exten-
25 sion of the shaft of the oscillatory engaging means which
26 extends from the device, as shown in detail in Fig. 4.
27 The sleeve assists in establishing a water-tight device
28 and can be utilized because the output motion of the
29 device is oscillatory rather than complete rotation. The
30 provision of this barrier is important not only from a
31 safety standpoint but also to the operating lifetime of
32 the device since cleansing-polishing agents are abrasive
33 by their nature and their migration into the workings of
34 the drive mechanism has been found to result in damage
35 to the mechanism.
36

37 The drive mechanism is shown in detail in the
38 partial sectional view of Fig. 3 wherein the upper section

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1 of containment means 11 is removed to provide a view of
2 the interior of the operating end 14. The power drive
3 module 36, typically a d-c electrical motor, has an out-
4 put shaft 25 which axially extends into the operating end
5 and is provided with support plate 26 having circular
6 gear 27 affixed thereto. The actuation of the power drive
7 module results in the rotation of gear 27.

8
9 The power drive module 36 is provided as shown
10 with internal threads for receiving the external threads
11 35 of the operating end. The ability to use the power
12 drive module with other operating ends for multiple user
13 capability is present. In other embodiments of the inven-
14 tion, the operating end and the power drive module can
15 be made integral if desired. In addition it should be
16 noted that the extension of the drive shaft 25 into the
17 operating end is preferred, however the power drive module
18 can incorporate the entire output shaft and circular gear
19 27 if desired.

20
21 As shown, the drive means in the operative
22 end includes the gear 28 centrally mounted on a substan-
23 tially vertical axis and having upstanding gear teeth
24 which mesh with the teeth of circular gear 27. Consequent-
25 ly, the rotational drive from the power module is trans-
26 lated through an angle of ninety degrees. Horizontal
27 gear 28 is provided with a raised central portion 29
28 upon which one end 32 of the connecting link 30 is movably
29 mounted for rotation in a horizontal plane. The end 32
30 is mounted on the raised portion 29 at a point spaced
31 from the vertical rotational axis on gear 28. As gear 28
32 is driven through a complete rotation, the end of the
33 connecting link moves about a circular path having a
34 radius equal to the distance between the mounting and the
35 axis of rotation of gear 28.

36
37 Driven means 34 is shown as a disc and is mount-
38 ed for rotation about a central off-vertical axis, shown

1 more clearly in Fig. 4. The opposing end 33 of the connect-
2 ing link 30 is rotatably attached at the upper surface of
3 driven means 34 at a distance from the axis of rotation
4 thereof. This distance is greater than the spacing of
5 end 32 from the axis of rotation of gear 28 so that one
6 revolution of gear 28 results in end 33 and driven means
7 34 transversing an arc of less than 180 degrees. In
8 the preferred embodiment, the ratio of the distances for
9 the ends 32 and 33 of link 30 is made such that the driven
10 disc 34 traverses and arc of about 120 degrees. One
11 revolution of gear 28 provides two traverses of the arcuate
12 path or one oscillatory cycle for the disc 34.

13
14 In Fig. 4, the gear 27 on the output shaft is
15 shown meshing with gear 28 mounted for rotation about a
16 vertical axis defined by shaft 40. The shaft 40 is
17 normally press fit into a mounting sleeve 41 bonded to
18 or molded in the underside of the operating end 14. The
19 gear 28 contains an integral raised central portion at
20 the top of which is rotatably pinned the end 32 of con-
21 necting link 30. Pin 39 is shown offset from the verti-
22 cal axis of gear 28 as defined by shaft 40.

23
24 The opposing end 33 of connecting link 30 is
25 movably coupled to the top surface of driven disc 34 by
26 pin 44. The coupling pin is spaced from the axis of
27 movement of the disc as defined by shaft 42 by a distance
28 greater than the offset spacing of end 32. In order to
29 accommodate the combination of drive gear, driven disc
30 and connecting link within the angled cross-sectional
31 area of the operating end 14, the rigid connecting link
32 is non-planar with the opposing ends essentially per-
33 pendicular to the axes of rotation of the drive gear and
34 driven disc. The axes are non-parallel due to the angu-
35 lar displacement of region 22. The portion of the connect-
36 ing link between the opposing ends is shown comprised of
37 two non-planar segments oriented to provide the coupling
38 for transmittal of the force. Other configurations of

1 the central portion of the link may be utilized if desired.

2
3 The shaft 42 of the driven disc 34 is journalled
4 in a split sleeve bearing 46 which is affixed to the
5 perimetrical surface of a hole formed in the underside
6 of the operating end. The disc is preferably made inte-
7 gral with the engaging means for receiving the appliance
8 20 and is shown affixed to the end of shaft 42 which
9 terminates at its outer end in expanded diameter portion
10 48. The flexible accessory is urged onto the engaging
11 means by forcing its receiving end over portion 48.

12
13 Also, shaft 42 has an intermediate section 49
14 of large diameter serving as a thrust plate with a con-
15 cave peripheral surface. Adjacent section 49 is the
16 bearing 46 for shaft 42 so that axial movement of the
17 driven disc and the engaging means is limited. A housing
18 47 for bearing 46 is placed over the engaging means and
19 moved upwardly to be fastened to both the outer surfaces
20 of the operating end and the bearing 46. The housing
21 47 is shown having a centrally located concave peripheral
22 portion.

23
24 The cylindrical sleeve 21 formed of a water
25 impermeable material serves as a water-tight boot that
26 prevents the entrance of the cleansing-polishing agent
27 into the operating end of the invention thereby substan-
28 tially increasing the service life of the device. The
29 boot can be independently replaced by removing the appli-
30 ance 20 and sliding the new sleeve over the concave por-
31 tion 49 of the engaging means onto the housing 47 and
32 its concave portions. The nature of the oscillatory
33 motion of the shaft 42 permits the use of a tight flexible
34 sleeve to cover bearing joints as contrasted with the ex-
35 posed joints found in fully rotational equipment.

36
37 The use of a longitudinally divided contain-
38 ment means permits the installation and testing of the

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1 components of the invention prior to sealing. The mount-
2 ing of the power drive means and the associated switch
3 in the containment means can be selected by the manufac-
4 turer in accordance with the type of drive motor and
5 power source favored. Reference to external connections
6 in hand held appliances may be found in my U.S. patent
7 3,921,298 issued November 25, 1975.

8
9 A second embodiment of the invention is shown
10 in Fig. 5 with like parts having the same reference num-
11 erals. This embodiment utilizes a threaded split bearing
12 46' which is placed about shaft 42 and threaded into
13 receiving housing 47' molded as a portion of the operating
14 end. The insertion of the piece part takes place from
15 the top prior to the affixation of the top portion of
16 the containment means. A thrust plate 50 is located on
17 the shaft 42 to limit axial movement. The shaft termin-
18 ates in an expanded diameter portion 48 which receives
19 the appliance to be driven. The connection of the driven
20 disc to the drive gear is the same for each embodiment.
21 If desired, a flexible boot can be provided by the use
22 of a right-angle sheath extending over the end and
23 contacting the sides of the thrust plate 50.

24
25 While the above description has referred to
26 specific embodiments of the invention, it is recognized
27 that many variations and modifications may be made there-
28 in without departing from the scope of the invention.
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1 CLAIMS

2 1. A personal health care device comprising:

3 a) containment means for housing a drive
4 mechanism therein and having an operative end and a body
5 portion;

6
7 b) power drive means mounted in said con-
8 tainment means and having an output shaft extending
9 therefrom, the actuation of said power drive means pro-
10 viding rotation of said output shaft;

11
12 c) drive means mounted for rotation about
13 a first axis at an angle to the axis of said output shaft
14 and operatively coupled thereto;

15
16 d) driven means mounted in said operative
17 end for rotation about a second axis at an angle to the
18 axis of said output shaft;

19
20 e) an elongated rigid link coupled to said
21 drive means a first distance from said first axis and
22 coupled to said driven means a second distance from said
23 second axis, said first distance being less than said
24 second distance whereby rotation of said drive means
25 imparts an oscillatory motion to the rotation of said
26 driven means;

27
28 f) engaging means affixed to said driven
29 means and extending outwardly of said operative end for
30 receiving an appliance thereon.

31
32 2. The device of claim 1 wherein at least a
33 portion of said operative end is angled from the body
34 portion of said containment means.

35
36 3. The device of claim 2 wherein said engaging
37 means extends outwardly of the angled portion of said
38 operative end.

4. The device of claim 3 wherein said engaging means comprises an expanded diameter end for removably receiving an appliance thereon.

5. The device of claim 4 further comprising sealing means coupled between said engaging means and the operative end of said containment means.

6. The device of claim 5 wherein said sealing means is a flexible sleeve frictionally engaging the operative end of said containment means and said engaging means.

7. The device of claim 6 wherein said elongated rigid link is non-planar and comprises first and second end segments substantially parallel with the drive means and the driven means respectively and a connecting segment therebetween.

8. The device of claim 3 further comprising a bearing means affixed to the angled portion of said operative end for rotatably receiving a portion of said engaging means therein.

9. The device of claim 8 wherein said bearing means comprises a section of reduced diameter and said engaging means has a section of reduced diameter, said sealing means being frictionally coupled to said sections of reduced diameter and extending therebetween.

10. The device of claim 9 wherein said elongated rigid link is non-planar and comprises first and second end segments substantially parallel to the drive means and the driven means respectively and a connecting segment therebetween.

11. The device of claim 10 wherein said first and second axes are non-parallel with respect to each other.

12. The device of claim 11 wherein the operative end of said containment means is removably affixed to the body portion thereof, said power drive means being mounted in said body portion and having the output shaft extending therefrom.

13. A personal health care attachment having an operative end and a securing end for use with a power drive module having an externally accessible power drive means, said attachment comprising:

a) means for removably affixing the securing end of said attachment to the power drive module;

b) drive means mounted for rotation about a first axis at an angle to the axis of said power drive means and operatively coupled thereto;

c) driven means mounted in an operative end of said attachment for rotation about a second axis at an angle to the axis of said power drive means;

d) an elongated rigid link coupled to said drive means a first distance from said first axis and coupled to said driven means a second distance from said second axis, said first distance being less than said second distance whereby rotation of said drive means imparts an oscillatory motion to the rotation of said driven means;

e) engaging means affixed to said driven means and extending outwardly of the operative end of said attachment for receiving an appliance thereon.

14. The attachment of claim 13 wherein at least a portion of said operative end is angled from the body portion of said attachment.

1 15. The attachment of claim 14 wherein said
2 engaging means extends outwardly of the angled portion
3 of said operative end.
4

5 16. The attachment of claim 15 wherein said
6 engaging means comprises an expanded diameter end for
7 removably receiving an appliance thereon.
8

9 17. The attachment of claim 16 further compris-
10 ing sealing means coupled between said engaging means
11 and the operative end of said attachment.
12

13 18. The attachment of claim 17 wherein said
14 sealing means is a flexible sleeve frictionally engaging
15 the operative end of said attachment and said engaging
16 means.
17

18 19. The attachment of claim 18 wherein said
19 elongated rigid link is non-planar and comprises first
20 and second end segments substantially parallel with the
21 drive means and the driven means respectively and a con-
22 necting segment therebetween.
23

24 20. The attachment of claim 15 further com-
25 prising a bearing means affixed to the angled portion of
26 said operative end for rotatably receiving a portion of
27 said engaging means therein.
28

29 21. The attachment of claim 20 wherein said
30 bearing means comprises a section of reduced diameter and
31 said engaging means has a section of reduced diameter,
32 said sealing means being frictionally coupled to said
33 sections of reduced diameter and extending therebetween.
34

35 22. The attachment of claim 21 wherein the
36 elongated rigid link comprises first and second end seg-
37 ments substantially parallel to the drive means and the
38 driven means respectively and a connecting segment there-
between.

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23. The attachment of claim 22 wherein said
first and second axes are non-parallel with respect to
each other.

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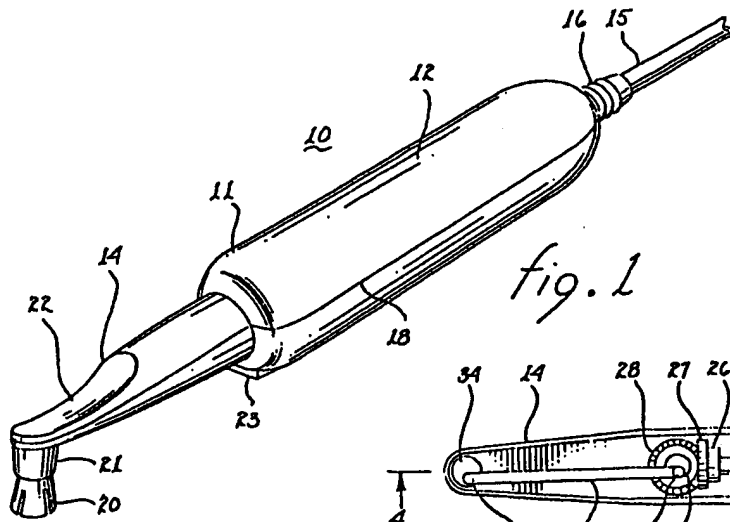


fig. 1

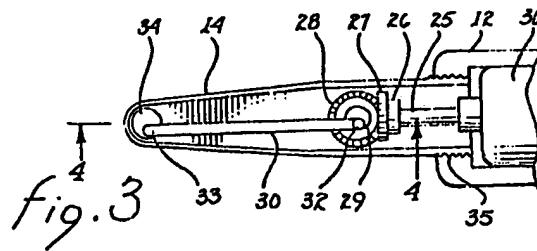


fig. 3

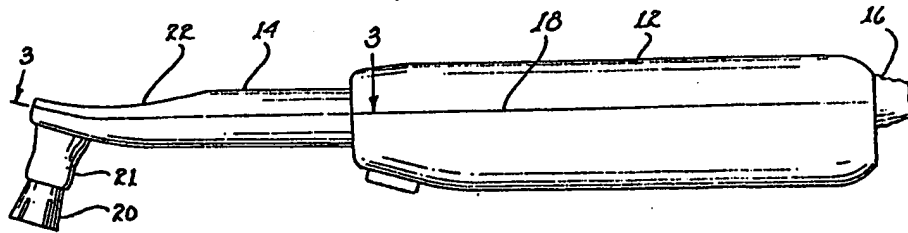


fig. 2

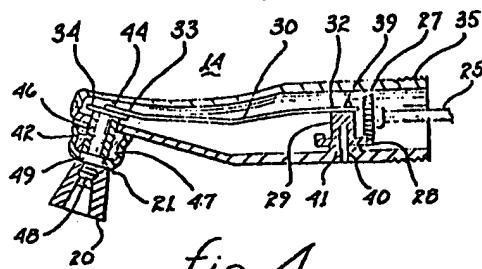


fig. 4

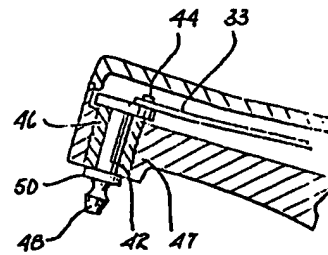


fig. 5

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